

FLOPPY DISC DRIVES

This invention relates to floppy disc drives.

A previously proposed floppy disc drive is shown in Figures 4 to 5 6.

Head supporting members, such as a head carriage 1 and a head support arm 2 shown in Figure 4, have until now been made of synthetic resin. The proximal end 2a of the head support arm 2 is secured to an arm supporting block 3, which is formed integrally with the proximal end of the head carriage 1, through a hinge plate 4 with screws 5. 10 A pair of upper and lower gimbal plates 6 made of leaf spring are welded to the respective free ends 1b and 2b of the head carriage 1 and the head support arm 2 on the peripheries 6a thereof so as to face each other, and thereby, a pair of upper and lower magnetic heads 7 which 15 are stuck on the respective centres 6b of the gimbal plates 6 are resiliently supported by the gimbal plates 6.

A pair of upper and lower shielding rings 8 are stuck on the respective gimbal plates 6 so as to surround the magnetic heads 7, and shield covers 9 are stuck on the respective other sides of the free ends 1b and 2b of the head carriage 1 and the head support arm 2, which 20 are opposite to the sides to which the respective gimbal plates 6 are secured. Each gimbal plate 6 is supported by a pin 10, which projects from the free end 1b or 2b or at the centre thereof and on the side opposite to the side to which the magnetic head 7 is secured.

25 A pair of flexible printed circuits 11 are arranged respectively along the head carriage 1 and the head support arm 2 so as to face each other, and each end 11a of the printed circuits 11 and a plurality of terminals 12 which project from the magnetic heads 7 are soldered together. Intermediate portions 11b of the printed circuits 11 are 30 welded to the head carriage 1 and the head support arm 2, respectively, through projections 13 projecting therefrom.

In use, the pair of magnetic heads 7 are brought into resilient contact with the respective sides of a floppy disc 14, which is a disc-like recording medium, mounted on a floppy disc drive, and while the 35 head carriage 1 is moved discretely together with the head support arm 2 in the radial direction of the floppy disc 14, information is selectively recorded on or reproduced from the rotated floppy disc 14

through one of the magnetic heads 7. At that time, the shield ring 8 and the shield cover 9 prevent the magnetic heads 7 from being influenced by an external magnetic field.

5 The shielding ring 8 made of magnetic material is small in size, as shown in Figures 5A and 5B, and must be stuck on the gimbal plate 6 with a predetermined orientation. In practice, after the magnetic head 7 has been stuck on the centre 6b of the gimbal plate 6, the periphery of the magnetic head 7 is coated with a synthetic resin 20 (Figure 5b) to reinforce adhesion of the magnetic head 7, and before the synthetic
10 resin 20 has cured, the shielding ring 8 is immersed in the synthetic resin 20 so as to adhere to the gimbal plate 6. Therefore, it is required to stick the shielding ring 8 in a short period of time and with high accuracy to surround the magnetic head 7. The periphery 6a of the gimbal plate is then welded to the head carriage 1 or the head
15 support arm 2.

Thus, there are the problems that the shielding ring 8 made of magnetic material is expensive; that the ring 8 is a separate part from the head carriage 1 and the head support arm 2, so that the assembling cost is entailed; that it is very troublesome to stick the small ring
20 8 on the gimbal plate 6 so as to be in an accurate position and with the predetermined orientation; and that the process of attaching the gimbal plate 6, on which the magnetic head 7 and the shielding ring 8 have already been stuck as described above, to the head carriage 1 or the head support arm 2 results in increasing the number of parts and
25 the steps required for assembly, and raising the manufacturing cost.

The head carriage 1 and the head support arm 2 are driven by a stepping motor (not shown). As shown in Figure 6, one end of a needle bar 16 made of steel wire, or the like, is mounted on a bracket 15 which is integrally formed with the head carriage 1, and is fixed to
30 the bracket 15. The other end of the needle bar 16 is engaged with the groove 19a of a feed screw 19 which is driven by the stepping motor. As a result, the head carriage 1 and the head support arm 2 are moved discretely in the radial direction of the floppy disc 14 due to torque of the stepping motor.

35 Thus, there are problems that the needle bar 16 is a separate part from the head carriage 1, so that the number of parts and the steps required for assembly are increased, and thereby, the

manufacturing cost is increased; and the screws 18 to fasten the plate 17 are apt to be loosened by vibration, resulting in imparting lost motion to the needle bar 16, or having the needle bar 16 fall off the bracket 15, so reducing the reliability of the floppy disc drive.

5 According to the invention there is provided a floppy disc drive comprising:

a magnetic head for recording information on and/or reproducing information from a floppy disc;

a carriage for carrying the magnetic head; and

10 drive means for driving the carriage so as to enable the magnetic head to scan a track on the floppy disc;

wherein:

the carriage is made of sheet metal and has a hole of substantially the same size as the magnetic head;

15 a shielding ring surrounds the hole; and

the magnetic head is fixed to the inside of the shielding ring with adhesive.

Preferably the drive means comprises a feed screw and a motor for driving the feed screw;

20 the carriage has an engaging portion to be engaged with the groove of the feed screw, and which is formed by pressing working of sheet-metal; and

the torque of the motor is transmitted to the carriage through the feed screw and the engaging portion of the carriage.

25 Advantageously the carriage is made of sheet metal;

the magnetic head and a supporting block, to which a head support arm is secured, are provided at the distal end and the proximal end of the carriage, respectively; and

30 ribs are formed between the magnetic head and the supporting block to reinforce the carriage, at the time of press working of the sheet metal.

The shielding ring member can be formed integrally with the head carriage by press working of sheet metal, so that the number of parts and the steps required for assembly are much reduced, and as a result,
35 the manufacturing cost is less.

By securing the magnetic head on the inside of the shielding ring member by adhesive the steps required for attaching the magnetic head

becomes simple, and attaching the magnetic head becomes easy.

An embodiment may provide a floppy disc drive in which a shielding ring member is not made of magnetic material, and is not a separate part from a head carriage, so that it becomes possible to
5 reduce the manufacturing cost.

—An embodiment may provide a floppy disc drive in which a magnetic head is protected from the influence of an external magnetic field not only by a shielding ring member, but also by a head carriage formed by press working of sheet metal, so that the magnetic shielding becomes
10 very good.

An embodiment may provide a floppy disc drive in which a portion to be engaged with a feed screw is formed integrally with a head carriage by pressing working of sheet metal, so that the number of parts and the steps required for assembly are much reduced, and as a
15 result, the manufacturing cost is less.

An embodiment may provide a floppy disc drive in which portion to be engaged with a driven feed screw is formed integrally with a head carriage by press working of sheet metal, so as not to impart lost motion to the engaged portion, or have the engaged portion separated
20 from the head carriage, so that the reliability of the floppy disc drive is much increased, and moreover, the head carriage is moved smoothly with high accuracy by the torque of the feed screw.

An embodiment may provide a floppy disc drive in which ribs provided to reinforce a head carriage are formed together with the head carriage when the head carriage is made by press working of sheet metal, so that the head carriage becomes not only thin and light, but
25 also high in rigidity.

Terminals provided on the back of the magnetic head can be connected to a circuit which is arranged along the lower face of the carriage, and through which signals are coupled to the magnetic head.
30 Moreover, a shield cover can be secured to the back face of the carriage so as to cover the hole on the inside of which the magnetic head is stuck, and the periphery of the hole.

The invention will now be described by way of example with
35 reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Figure 1 is an enlarged sectional view illustrating a shielding

ring formed together with a head carriage of an embodiment of floppy disc drive according to the present invention;

Figure 2 is an enlarged sectional view illustrating an engaged portion of the head carriage of Figure 1, engaged with a feed screw;

5 Figure 3A is an exploded, perspective view of the head carriage of Figure 1;

Figure 3B is perspective view of the head carriage of Figure 1;

Figure 4 is a sectional view of a previously proposed floppy disc drive;

10 Figure 5A is an exploded, perspective view of a shielding ring of the floppy disc drive Figure 4;

Figure 5B is a perspective view of a shielding ring of Figure 5A; and

15 Figure 6 is a perspective view of a portion to be engaged with a feed screw, which is incorporated in the floppy disc drive of Figure 4.

Referring to Figures 1 to 3, a head carriage incorporated in a floppy disc drive embodying the present invention will be described. A head carriage 21 shown in Figure 1 is formed by press working sheet metal, and a shielding ring 22 formed by drawing during the press working extends upwards from the free end 21a of the head carriage 21. 20 A magnetic head 7 is fitted into a space 22a formed inside the shielding ring 22 and stuck on the inside of the shielding ring 22 with adhesive, and a plurality of ribs 23 to reinforce the head carriage 21 are formed to project downwards from the head carriage 21.

25 A flexible printed circuit 11 is arranged along the longitudinal direction of the head carriage 21 on the bottom face thereof between the ribs 23, one end 11a of the printed circuit 11 is being soldered to a plurality of terminals 12 (including an earth terminal) provided in the magnetic head 7, or stuck on the terminals 12 by a conductive 30 adhesive, and an intermediate portion 11b is fixed to the bottom face of the head carriage 21 with adhesive. A shield cover 9 to cover the back face of the magnetic head 7 and the periphery thereof is fixed to the lowest faces of the ribs 23 with adhesive.

35 As shown in Figure 3A, a narrow bracket 24 projects from one side of the proximal end 21b of the head carriage 21, and on the distal end of the narrow bracket 24, an engaged portion 25 to be engaged with the groove of a feed screw 43 is integrally formed. The engaged portion 25

is formed by drawing during the press working so as to project upwards from the bracket 24, and has the shape, for example, of the letter "V" in section.

Similarly, a wide bracket 26 projects from the other side of the proximal end 21b of the head carriage 21, and a pair of bearing blocks 27 are integrally provided thereunder. Into the bearing blocks 27, respectively oil-less thrust bearings 28 are fitted. In addition, a projection 29 for supporting a torsion coiled spring 32 (Figure 3B) is formed integrally near to the narrow bracket 24.

As shown in Figure 3B, a supporting block 30 is fixed to the tip of the proximal end 21b of the head carriage 21 by a plurality of screws 31 (Figure 3A), and one end of a hinge plate 4 is fixed to the top of the supporting block 30 with screws 5. A head support arm 2 is fixed to the other end of the hinge plate 4, and pressed downwards by one end 32a of the spring 32 whose coiled portion is mounted on the projection 29, and the other end of which is pressed against the proximal end of the projection 29.

A guide shaft 41 horizontally supported by a chassis (not shown) of the floppy disc drive is inserted into the pair of thrust bearings 28, and the groove 43a of the feed screw 43, which is also supported by the chassis so as to be parallel to the guide shaft 41, and driven by a stepping motor 42, is engaged, from above, with the engaged portion 25 of the head carriage 21.

A torsion coiled spring 45 is provided so as to be supported by a projection 44 which projects from one side of the supporting block 30. One end of the spring 45 abuts against the face of the head carriage 21, and the other end 45a abuts, from above, against the feed screw 43 to press the groove 43a of the feed screw 43 against the engaged portion 25 of the head carriage 21.

In use, the pair of magnetic heads 7 supported respectively by the head carriage 21 and the head support arm 2 are brought into resilient contact with the upper and lower side of a floppy disc 14 due to the spring 32, and the head carriage 21 is moved discretely together with the head support arm 2 in the radial direction of the floppy disc 14, as the engaged portion 25 of the head carriage 21 is engaged with the feed screw 43 which is driven by the stepping motor 42. Thus, information is recorded on or reproduced selectively from either side

of the rotated floppy disc 14 through the magnetic head 7.

At that time, the magnetic head 7 is protected from the influence of an external magnetic field not only by the shielding ring 22 which is formed integrally with the head carriage 21 by sheet metal stamping, and the shield cover 9 which is secured to the lowest faces of the ribs 23, but also by the whole of the head carriage 21.

Moreover, the engaged portion 25 of the head carriage 21, which is driven by the feed screw 43, is formed integrally with the head carriage 21 by press working sheet metal, so as not to impart lost motion to the engaged portion 25, or have the engaged portion 25 separated from the head carriage 21, so that the reliability of the floppy disc drive is much improved and further, the head carriage 21 is moved smoothly with high accuracy by a torque of the driven feed screw 43.

Various modifications are of course possible, for example, the shape of the engaged portion 25 of the head carriage 21 may be different.

CLAIMS

1. A floppy disc drive comprising:
a magnetic head for recording information on and/or reproducing
5 information from a floppy disc;
a carriage for carrying the magnetic head; and
drive means for driving the carriage so as to enable the magnetic head
to scan a track on the floppy disc;
wherein:
10 the carriage is made of sheet metal and has a hole of substantially the
same size as the magnetic head;
a shielding ring surrounds the hole; and
the magnetic head is fixed to the inside of the shielding ring with
adhesive.
15
2. A floppy disc drive according to claim 1, wherein terminals on
the magnetic head are connected to a circuit which is arranged along
the lower face of the carriage, for coupling signals to the magnetic
head.
20
3. A floppy disc drive according to claim 1 or claim 2, wherein a
shield cover is secured to the back face of the carriage so as to cover
the hole, and the periphery of the hole.
- 25 4. A floppy disc drive according to claim 1, wherein the drive means
comprises a feed screw and a motor for driving the feed screw;
the carriage has an engaging portion to be engaged with the groove of
the feed screw, and which is formed by pressing working of sheet-metal;
and
30 the torque of the motor is transmitted to the carriage through the feed
screw and the engaging portion of the carriage.
5. A floppy disc drive according to claim 1, wherein the carriage is
made of sheet metal;
35 the magnetic head and a supporting block, to which a head support arm
is secured, are provided at the distal end and the proximal end of the
carriage, respectively; and



ribs are formed between the magnetic head and the supporting block to reinforce the carriage, at the time of press working of the sheet metal.

- 5 6. A floppy disc drive substantially as hereinbefore described and illustrated with reference to Figures 1 to 3B of the accompanying drawings.
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